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AUTHOR Mustapha, Ramlee B.
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ABSTRACT

Development of information technology (IT) and the Multimedia Super Corridor (MSC) project has placed Malaysia within the global interconnectivity along with other developed nations. Types of IT applications are e-learning, e-mail, discussion group mailing lists, bulletin board systems, chat mode, newsgroups, Internet, tutorial, hypermedia, and file transfer protocol. These advantages of IT are documented in the literature: enhanced student motivation; enhanced research, critical thinking, organizational, and presentation skills; easy access to Internet resources; and ability of technical and vocational educators to create effective contextual learning experiences for learners. These limitations of IT have been cited: cognitive overload; no quality monitoring of materials; and tendency for users to plagiarize the material. The aim of IT programs in technical and vocational institutions is to produce semi-skilled IT workers competent in diverse areas of IT and multimedia technologies. Two approaches have been used in teaching IT: learning about IT and learning with IT. Public polytechnics have offered IT programs at the Certificate (2-year) and Diploma (3-year) levels. Barriers to IT implementation are: minimal level infrastructure and facilities for computer and Internet at the school level; inadequate number of computers in schools; computer illiterate teachers; and lack of ongoing technical support. (Contains 27 references.) (YLB)

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R. Mustapha

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By:
Ramlee B. Mustapha, Ph.D.
Faculty of Education,
Universiti Kebangsaan Malaysia,
43600 Bangi,
Selangor, Malaysia

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By:
Ramlee B. Mustapha, Ph.D.
Faculty of Education,
Universiti Kebangsaan Malaysia, 43600 Bangi,
Selangor, **Malaysia**

Abstract

Prime Minister, Mahathir Mohamad created a distinct cyberwave in 1996 when he officially launched the concept of Multimedia Super Corridor (MSC) at the Asia Multimedia Conference '96 in Kuala Lumpur. The development of the MSC project has placed Malaysia within the global interconnectivity with other developed nations in the world. Efforts are currently being made to fully utilize IT in transforming the Malaysian society into a knowledge-based society. The advancement of the Internet and the multimedia technologies has been increasingly visible in the government and corporate sectors. Although Malaysia has made great strides in enhancing IT infrastructure, the IT utilization and structure in technical and vocational institutions are still inadequate. Technical and vocational teachers and administrators should reevaluate and restructure the curriculum so that the curriculum is viable for IT skills to be developed among students. Therefore, the administrators and educators should be urged to plan the curriculum carefully and systematically in meeting the needs of the society as a whole. The government should concentrate on strengthening IT infrastructure so that every technical and vocational institution will be connected to the Information Super Highway. With the development of knowledge-based economy, the technical and vocational education should focus on knowledge and higher order skills besides the technical skills. Adequate IT and multimedia training for technical and vocational teachers and support staff is vital to facilitate effective teaching and learning. There is a need for a flexible approach to learning. Learning can take place either on-line or off-line.

Introduction

The development of the information technology (IT) and the Multimedia Super Corridor (MSC) project has placed Malaysia within the global interconnectivity with other developed nations in the world (Mohd Nizam & Mohd Helmi, 1999). Efforts are currently being made to fully utilize IT in transforming the Malaysian society into a knowledge-based society. The advancement of the Internet and the multimedia technology has been increasingly

visible in the government and corporate sectors. This is in line with the Vision 2020 as the Prime Minister asserts:

> "In the information age that we are living, the Malaysian society must be information rich. It can be no accident that there is no today wealthy, developed country that is information poor and no information rich country is poor and undeveloped" (Wawasan 2020, 1991, p.36).

To achieve the aim of the MSC and the Vision 2020, the initiative to integrate the use of IT and multimedia technologies in technical and vocational education is timely. The Ministry of Education seems serious in paving its way to equip schools with computers and appropriate telecommunications for databases and Internet facility. The Ministry has launched *Komputer Dalam Pendidikan* (Computer in Education) program in 1992 to enhance computer literacy among Malaysian teachers and students (Berita Harian, 29 September 1999). In 1999, the Minister of Education announced that by 2005, all public schools in Malaysia will have at least 10 computers (Berita Harian, 29 September 1999).

The IT and multimedia revolution has virtually permeated every sector of the society. It has transform the way people live and work, communicate, entertain, and conduct business. Further, the unprecedented demand for IT professionals has never been more critical (Peng, 2000). This challenge has enormous implications for both the classroom and research (Saunders, 1998). However, in Malaysian schools, it seems that the IT frenzy is just another slogan or rhetoric or just a cosmetic. Unless a real commitment is made, the IT innovation in Malaysian schools will be considered as just another fad or something that the politicians is pushing.

At any rate, the future of Malaysia's competitiveness depends on the skills of its workforce. As the demand for IT professional is increasing, Malaysia should be prepared to provide adequate IT and knowledge workers in this country. Since technical and vocational program is one of the largest sectors that supply semi and skilled workers in this country, it is critical to assess the quality of IT and multimedia programs in technical and vocational institutions in Malaysia.

Statement of the Problem

According to the Seventh Malaysia Plan (1996 – 2000), a sum of RM 2.3 billion is allocated to Ministries and public agencies to invest in IT-related programs and projects (Economic Planning Unit, 1996). These include building IT infrastructure and providing IT training to promote IT literacy in the public and private sectors. However, little is known about IT literacy among technical and vocational educators in Malaysia. Further, research regarding the effectiveness of the pre- and in-service preparation of technical and vocational educators in IT is minimal. Therefore, it is critical to assess the quality of IT and multimedia programs in technical and vocational education and to determine the factors that can enhance IT and multimedia utilization in technical and vocational institutions in Malaysia.

Computers and the Virtual Classrooms

Today's technology is finally providing learning tools that combine the best of both worlds: computers and classrooms (Greengard, 1998). With the improved capabilities of the Web browsers and better software, it is possible to create a collaborative virtual learning environment. E-learning is becoming a viable option for many organizations. The biggest advantage to the virtual classroom is cost-savings. In addition, it is possible to reduce travel and keep employees selling products or working with clients when they might otherwise be parked in a classroom. The on-line environment can be tailored toward obtaining knowledge and skill-based training (Greengard, 1998).

Multimedia Super Corridor (MSC) and the Smart School Project

The Prime Minister created a huge cyberwave in 1996 when he officially launched the MSC at the Asia Multimedia Conference '96 in Kuala Lumpur (Nurhizan Abdul Manab & Azman Othman, 1999). The MSC is a 15-by-50 kilometer zone encompassing the world's tallest building Petronas Twin Tower and the new ultra modern International Airport in Sepang. It aims at revolutionizing IT and multimedia industries by creating a massive corridor with conducive environment for local and international companies wanting to create, distribute, and employ IT and multimedia products and services. (Nurhizan

Abdul Manab & Azman Othman, 1999). MSC is also expected to place Malaysia as a regional and international technology and telecommunication hub. The MSC will propel the transfer of technology and become the test bed for R&D in high-tech industries (Abd. Halim Mohamed et al, 1999). It is estimated that the Multimedia Super Corridor will need 23,000 knowledge workers by the year 2000 (IT Malaysia, 1998).

Due to the increasing demand for knowledge workers to work in the IT and high-tech industries of the MSC, Smart Schools program was adopted as one of the seven Flagship applications. The flagship will support the government's plan to obtain the status of an industrialized nation by the year 2020 and to gain a competitive edge over other developing countries in the global economy (Abd. Halim Mohamed et al, 1999). In the Smart School concept, learning will be self-directed, individually-paced, contextualized and reflective using IT as a prime enabler (Nurhizan Abdul Manab & Azman Othman, 1999). It is hoped that, eventually, all schools in this country will be smart schools.

Types of IT Applications

- **E-learning**. E-learning is gaining popularity as educational institutions continue to keep pace with the needs of their students. Working parents are taking Web-based courses at times convenient to their schedules. Students in remote areas are using e-mail to communicate with instructors they may never meet in person (Hodgson, 1999). In the United States, a recent Department of Education study of postsecondary education found that 58 percent of two-year and 62 percent of four-year public colleges offer on-line distance education courses. Another 28 percent of two-year and 23 percent of four-year public colleges plan to start offering e-learning within three years (Hodgson, 1999).
- **E-mail.** Electronic mail. Messages sent from one person to another via computer networks. A way to personally communicate with others over the Internet or within a network.
- **Discussion group mailing list.** To maximize the factors that enhance learning and networking using electronic mail and to minimize those factors that inhibit learning using this media. Focus on e-mail discussion group that supports

informal learning contexts. These include community groups, groups using e-mail for professional development purposes, and within organization groups.

- **Bulletin Board System.** A dial-up and/or internet accessible computer service which allows users to post and retrieve messages and files. BBSs often serve specific interests or geographical areas. Some BBSs are connected and provide access to the Internet.
- **Chat mode.** Form of telecommunications in which messages are exchanged in real time rather than stored for later reading.
- **Newsgroup.** A broad grouping of on-line discussion groups. Most newsgroups are distributed through USENET.
- **Internet.** The international network of networks that uses standard computer formats to allow information exchange. The Internet came into being between the late 1970s and early 1980s with the development and adoption of TCP/IP. TCP/IP allowed ARPAnet to join with other networks.
- **Tutorial.** A learning activity in which the computer primarily presents new information to students and provides opportunities for the student to become proficient with the information.
- **Hypermedia.** Multimedia that a user can examine in a flexible, nonlinear fashion. The user can typically move from one information source to several others and can control which of these options to take.
- **FTP.** File Transfer Protocol. The standard rules that govern the transfer of files and programs over the Internet. FTP allows files to be moved from one computer to another regardless of the types of computers or operating systems involved in the exchange.

Advantages of IT

Potential strengths and weaknesses of IT in teaching and learning have been well documented in the literature, with the former probably outweighing the latter (Ng & Glenwright, 1999). Warschauer (1996) asserts that IT can enhance student motivation by helping students gain knowledge and skills about using computers, giving ample opportunity to use electronic communication, and

carefully integrating computer activities into the regular structure of the lesson for meaningful learning.

Morrall (1999) supports the notion that IT can be used to enhance research skills in finding relevant resources; critical thinking skills in judging the reliability and usefulness of those resources; organizational skills in analyzing information; and presentation skill in communication information efficiently and effectively. Bush and Terry (1997:303) suggest that IT can increase learner's autonomy. They assert:

> "...learner-centred approach in IT teaching also allows learners to decide what sources to study from, when and at what pace to study, and what depth to study to. Learners can study in a way that suits their learning style, as they can use the computer as a tool for communication, or as a surrogate teacher, an infinitely patient personal tutor."

Autonomy, authenticity, and higher order thinking skills are not the only advantages of IT. Jor (1999) noted that teachers and learners could easily access an almost limitless variety of resources on the Internet. They could, then share these information and resources with their peers any time, any where since electronic communication imposes no boundaries of time or geographical location. Furthermore, on-line interactive multimedia educational websites may assist learners in a mixed ability classroom. A number of the websites provides challenging materials and activities for accelerated students and remedial or tutorial material for slower learners (Godwin-Jones, 1996). The IT and Internet can also promote collaborative teaching and learning.

In addition, the introduction of IT and multimedia technologies in technical and vocational education allows educators to create effective contextual learning experiences for vocational learners (Hull, 1999). To teach contextually is to put learning in the context of real-world activities and problems and to position learners as thinkers and problem-solvers. To teach contextually also is to use a variety of strategies to reach the many different types of learners. In contextual learning emphasis shifts from learning a narrow body of knowledge or a narrow set of skills to learning how to learn. Contextual learning emphasizes the way that knowledge is embedded and applied in real-world activities,

including the world of work. In technical and vocational education, a contextual learning approach gives meaning and depth to learning.

According to Hull (1999), contextual teaching calls for a classroom with a porous relationship to the outside world, one in which learners are in frequent contact with adults engaged in professional work and peers engaged in contextual learning. Through the projects and performances to an audience outside the school. However, contextual teaching has been difficult to carry out within traditional school structures. Many schools lack resources to participate in contextual learning. Concerns about liability, transportation, and propriety knowledge often keep students from the workplace. Therefore, multimedia technologies and the Internet can provide schools with potential access to the world outside of the school. For instance, using the World Wide Web to connect teachers and learners to the workplace. A learner can use multimedia technology to stimulate a problem-solving environment. Similarly, a teacher can use video conferencing technology to connect learners to wide ranging of staff and workers of a company for career exploration and on-the-job experiences.

The increasing availability of IT and computer-based training (CBT) provides an effective alternative training method that has the potential to revolutionize the training process. According to Hoffman (1998), the benefits include: 1) less time to complete, thus less time away from productive work; 2) self-paced learning; 3) automated testing, grading, and reporting of results; and 4) the potential for 'just-in-time' refresh of previous training material.

In recent years, continuous video has emerged as an important element of the multimedia technology revolution. Applications such as digital libraries, distance learning, digital broadcasting, and virtual conferencing promise to stretch IT to its limit (Koodli, 1998). Traditional tools used in education, such as black or white board, overhead transparencies, slides, and video tapes, are increasingly complemented with computer-based multimedia material (Van Reeth & Coninx, 1998).

The World Wide Web (WWW) is becoming increasingly essential for teaching and learning in this information age. Improved tools for developing Web-based teaching and learning materials, together with the continuous training for the educators have led to a greater confidence in IT and multimedia technologies (Allen, 1999). Slogans such as "connecting the classroom to the world", and "the world at your fingertips" reflect today's interest on accessing a much broader information base through the web (Means, 2000).

Limitations of IT

Problems and disadvantages of IT certainly exist. Liu (1994) argued that sheer volume of information in cyberspace imposes additional cognitive overload upon a user as he/she tries to keep track of link and makes decisions on how to proceed. As a result, students may be attracted to other topics and be diverted away from subject matter that is relevant. Indeed this problem may pose difficulties since there is no proper quality monitoring over materials posted on the Internet as there is for published books and journals so the users need to employ more critical thinking about the content of Internet teaching materials (Morrall, 1999). Further, users may tend to plagiarize the material, as it is relatively easy to copy and paste information from the internet for their assignments (Morrall, 1999).

IT and Multimedia Programs in Public Technical and Vocational Institutions

The aim of IT program in technical and vocational institutions in Malaysia is to produce semi-skilled IT workers who are competence in diverse areas of IT and multimedia technologies (Ministry of Education, 1999). The graduates are expected to be employed as IT semi-professionals in the areas of administration, commerce, business and industry. The program combines three major themes, namely, organization, software development, communication and digital technology. Specifically, the objectives of the program include:

1. to utilize recent knowledge in developing IT application software, such as multimedia programs, digital media, and electronic publishing.
2. to maintain and trouble shoot networking and computer-related problems.

3. to utilize multimedia software to design, test, and evaluate IT or multimedia project.
4. to utilize IT and multimedia technologies to solve problems.

At the secondary school level, IT is an elective subject. This subject is offered to provide basic knowledge and skills in IT and also to enhance awareness regarding the challenges of the IT era. Those students who have taken this elementary IT course may find it easier to further their studies in IT at the post-secondary level. The knowledge components in this course include computer system, applications software, and multimedia technologies. The skill components include communication, data management, problem-solving, and basic programming and networking.

Two approaches have been used in teaching IT at the school level, namely, "learning about IT" and "learning with IT" (Ministry of Education, 1999). The first approach "learning about IT" is to provide basic knowledge about IT and the second approach is to use IT to solve problem. These two approaches require both "hands-on" and "mind-on".

Recently, public polytechnics in Malaysia have offered IT programs both at the Certificate (2-year) and Diploma level (3-year). At the Certificate level, five polytechnics – *Politeknik Ungku Omar, Politeknik Sultan Abdul Halim Mu'adzam Shah, Politeknik Kuching, Politeknik Johor Bahru*, and *Politeknik Seberang Prai* are involved. At the Diploma level, only two polytechnics are offering the IT programs, namely, *Politeknik Ungku Omar and Politeknik Seberang Prai* (Ministry of Education, 1999).

The core courses in the Certificate level include: programming, software applications, computer in IT, basic electronic and microprocessor, operating system, algorithm and data structure, data communication, information system, computer architecture, multimedia, and the senior project. Additional courses for the Diploma program include: software engineering, managing databases, project management and human resource, computer networking, object-oriented

programming, hypermedia, information management system, and human-computer interface (Ministry of Education, 1999).

Private post-secondary technical institutions have begun offering IT courses and programs much earlier than the polytechnics and the number of private technical institutions offering IT courses is far greater than the polytechnics.

Barriers in Implementing IT

Information Technology presents many challenges to the education system. At the school level, especially in public school system, the infrastructure and the facilities for computer and the Internet are still at the minimal level (Lukman Ismail, 2000). Moreover, Bumiputra is still lagging in IT behind other races in this country. This can be seen from the Internet usage among Bumiputra and non-Bumiputra. In large cities and metropolitan areas where the majority of non-Bumiputra resides, the Internet usage is high. For example, Kuala Lumpur and Selangor show the highest Internet users which is 23.9 and 26.3 percent respectively (Lukman Ismail, 2000). In states where Bumiputra is the majority, the Internet usage is relatively low. Similarly, in most national schools, the computer and IT infrastructure are inadequate as compared to Chinese schools (Lukman Ismail, 2000).

In general, schools in Malaysia continue to lag behind other sectors such as business and entertainment in utilizing IT and multimedia technologies. A majority of schools still do not have enough computers and Internet facility for most students to use frequently. However, during the last decade the increase in IT access and the emergence of new telecommunication technologies have somewhat changed how teachers perceive technology and its applications in teaching and learning.

In addition, some teachers who are not computer literate need extra time to acclimatize to the new technology. Broad provision of training resources is, therefore, essential to avoid any serious deficiencies in IT competency (Morrall, 1999). Finally, on-going technical support is likely to remain a crucial factor for the smooth implementation of IT lesson since not every teacher can be an IT

specialist . Indeed, some complicated operations are probably destined to remain beyond the capabilities of most teachers. It would be unrealistic to expect a classroom teacher to spend time and effort to create Internet materials.

Future Trends in IT

The areas of IT impact on our society are vast and widespread and many more areas are bound to appear in the years to come. However, some of the prominent areas in which rapid development is likely to take place are in telecommunication, the Internet, business and government, education, and entertainment.

1. Telecommunication – the drive toward implementing multimedia and broadband networks will be accelerated. The convergence of the computer, the telephone, and the TV industries will take place rapidly.
2. Wireless Internet – the use of wireless and mobile Internet will be accelerated.
3. Business and Government – on-line banking and shopping, e-economy, e-commerce, EDI, virtual manufacturing, telemedicine, and e-government are being implemented.
4. Education – e-learning, web learning, virtual universities, multimedia and distance learning will move forward rapidly.
5. Entertainment – digital radio and TV, digital movies and interactive TV, video-on-demand will become new trend in entertainment industry.

Conclusion, Implications, and Recommendations

It is evident that the government policies clearly emphasize the crucial role of IT but the implementation is largely unsatisfactory especially at the primary and secondary school levels. The need for the highest level commitment to equip Malaysian schools with computers and IT facilities is critical. For example, in the United States in 1994, the percentage of the US classrooms with Internet access was just 3 percent. In 1996, President Clinton announced a set of national education goals which included connecting every classroom in the US to the Internet. By 1997, the proportion of connected classrooms had grown to 27 percent (National Center for Education Statistics, 1999). In 1999, the US department of Education announced that over half of the US classroom have

Internet access; by the Fall 1999, the department expects 80 percent of the US classrooms to have Internet connection. This was partly attributed to the impact of the "E-rate" or telecommunications discount to schools and libraries passed by the US Congress in 1996 (Means, 2000).

The implementation of IT and multimedia technologies has not yet reached their satisfactory level in technical and vocational settings. To reach their maximum potential requires full commitment, serious thinking, research, and experimentation. Although Malaysia has made great strides to enhance IT infrastructure, the IT utilization and structure in technical and vocational institutions are still inadequate. Technical and vocational teachers and administrators should reevaluate and restructure the curriculum so that the curriculum is viable for IT skills to be developed among students (Abd. Halim Muhamed et al, 1999). Therefore, the administrators and educators should be urged to plan the curriculum carefully and systematically in meeting the needs of the society as a whole.

Future workplace requires a radically different organization of work and a radically different kind of workforce (Abd. Halim Muhamed et al, 1999). Given the often sophisticated operational requirements of an IT classroom, adequate training is also vital if teachers are to apply the requisite skills to facilitate effective teaching and learning. Those with computer-anxiety might need extra time to acclimatize to the new technology. Broad provision of training resources is, therefore, essential to avoid any serious deficiencies in IT competency (Morrall, 1999). Similarly on-going technical support is likely to remain a crucial factor for the smooth implementation of IT lesson since not every teacher can be an IT specialist. Indeed, some complicated operations are probably destined to remain beyond the capabilities of most teachers. It would be, therefore, unrealistic to expect a classroom teacher to spend time and effort to create Internet materials.

Recommendations

1. The government should concentrate on strengthening IT infrastructure so that every technical and vocational institution will be connected to the Information Super Highway.
2. With the development of knowledge economy, the technical and vocational education should focus on knowledge and higher order skills besides the technical skills.
3. Adequate IT and multimedia training for technical and vocational teachers and support staff is vital to facilitate effective teaching and learning.
4. There is a need for a flexible approach to learning. Learning can take place either on-line or off-line.

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